

INSTRUCTION MANUAL



RavenXTG GPRS/EDGE **Sierra Wireless Cellular Modem**

Revision: 12/13



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815 West 1800 North
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Table of Contents

PDF viewers: These page numbers refer to the printed version of this document. Use the PDF reader bookmarks tab for links to specific sections.

1. General Description.....	1
2. Establish Cellular Service	1
2.1 RavenXTG Cellular Coverage/Service Requirements	1
3. Specifications	2
3.1 RavenXTG Specifications.....	2
4. Configuration	3
4.1 Base Station Requirements for RavenXTG.....	3
4.2 Datalogger Site Equipment	3
4.3 Wiring and Connections.....	6
4.3.1 Modem Connections Using PN 18663 Null Modem Cable	6
4.3.2 Modem Connections Using the SC105	7
4.3.3 Modem Connections Using the SC932A	8
4.4 Power Considerations.....	9
4.5 Automatic Provisioning (Activation)	9
5. Using AceManager to Program the Modem	11
5.1 Configuring the RavenXTG for Dynamic IP	15
6. LoggerNet/PC400 Software Setup.....	17
6.1 Test the Cellular Connection.....	19
7. Troubleshooting.....	20

Appendices

A. AceManager Setup without Template File.....	A-1
B. Installation of SIM Card in the RavenXTG	B-1
C. Configuring the RavenXTG Modem for PPP	C-1

**D. EmailSend Using the Gmail Outgoing SMTP
Server..... D-1**

D.1	Setting up a Gmail Account.....	D-1
D.2	Sending to Multiple Addresses.....	D-1
D.3	Sending a Text Message to a Phone	D-2

E. Troubleshooting Flowchart..... E-1

Figures

4-1.	Antennas for use with the Raven modems	5
4-2.	Connections using PN 18663 Null Modem Cable.....	6
4-3.	Connections using the SC105.....	7
4-4.	Connections using the SC932A.....	8
7-1.	Device Port configuration.....	24
7-2.	AceManager status page showing communications with modem	25
B-1.	Modem faceplate	B-1

RavenXTG GPRS/EDGE Sierra Wireless Cellular Modem

1. General Description

This manual provides information for interfacing the Sierra Wireless RavenXTG cellular modem to Campbell Scientific dataloggers. A Sierra Wireless CD ships with the modem that includes Sierra Wireless manuals and software utilities. Sierra Wireless manuals referenced in this manual include:

AceManagerGuide.pdf
Raven_XT_UserGuide.pdf
Raven_XT_QuickStart.pdf

The RavenXTG digital cellular modem is manufactured by Sierra Wireless for use on the AT&T General Packet Radio Service (GPRS) network. The modem is accessed through the Internet using TCP/IP communications protocol using a Static or Dynamic IP address.

- A Static IP address is permanently assigned to a particular account and will always be used whenever the RavenXTG connects to the Internet.
- A Dynamic IP address is assigned on a “need to have” basis. A dynamic IP address is used with a service such as IP Manager (Section 5.1, *Configuring the RavenXTG for Dynamic IP*) to translate a (domain name) to a dynamic IP address, so that the RavenXTG can be contacted by name as if it had a static IP.

An AT&T GPRS/EDGE account can be setup for a Static or Dynamic IP address. A data account with the I2gold APN as described in Section 2.1, *RavenXTG Cellular Coverage/Service Requirements*, will have a Static IP address.

Template files from CSI’s website (www.campbellsci.com/downloads) are used to configure the RavenXTG modem to function as a serial server or in Point-to-Point protocol (PPP).

2. Establish Cellular Service

2.1 RavenXTG Cellular Coverage/Service Requirements

What you need:

- AT&T GPRS/EDGE coverage at the datalogger site (for a coverage map refer to: www.wireless.att.com/coverageviewer)
- GPRS/EDGE business account established with AT&T

To setup a GPRS/EDGE business account, contact your AT&T Business Account Representative or Blu-Telecommunication.

Blu-Telecommunication is part of the Alliance Channel with AT&T, and can assist any customer nationwide. Blu-Telecommunication will contact AT&T and work with an AT&T account manager to setup an account.

Contact information for Blu-Telecommunication:

Phone number: (877) 422-2616, or Email box: i2gold@blu-tel.com

What to ask for: M2M Setup

Who to ask for: Carlos Morales or Andy Tran

An Access Point Name (APN) must be added onto the account, which makes the modem accessible through the Internet. For networks with fewer than (30) modems, the standard 'I2Gold APN' can be used; networks with more than (30) modems will require a 'Custom APN'. A Custom APN has a setup fee starting at \$500, and takes a minimum of 7 to 14 business days to complete. The user must program the APN name into the modem as described in Section 5, *Using AceManager to Program the Modem*.

AT&T will provide a SIM card for each modem. The SIM card must be installed inside of the modem as described in Appendix B, *Installation of SIM Card in the RavenXTG*. In addition to the SIM card, you should receive:

- 10-digit MSISDN number (telephone number associated with the SIM, used for billing)
- IP Address and APN for GPRS/EDGE service

3. Specifications

3.1 RavenXTG Specifications

Sierra Wireless RavenXT, model G2212-C GPRS modem

Technology:	GPRS (MS-12)
Bands:	Quadband, 1900/850 MHz and 1800/900 MHz
Transmit Frequency:	1850 to 1910 MHz and 824 to 849 MHz
Transmit Power:	1.0 W for 1900 MHz; 0.8 W for 850 MHz
Receiver Frequency:	1930 to 1990 MHz and 869 to 894 MHz
GPRS Throughput:	up to 70 kbps
RS-232 Data Rates:	1200 bps to 115.2 kbps
Serial Interface:	RS-232, DB9-F
Serial Protocols:	AT Commands, PPP, SLIP, UDP, TCP
RF Antenna Connector:	50 Ohm SMA (female)
Input Current Range:	40 to 250 mA

Typical Current Drain (at 12 Vdc):	50 mA dormant (idle for 10 to 20 seconds), 120 mA transmit/receive
Input Voltage Range:	6 to 28 Vdc
Operating Temperature Range:	–30° to +65°C
Operating Humidity Range:	5% to 95% RH non-condensing
Status LEDs:	Power, Network, Signal, Activity
Dimensions	
Width:	7.6 cm (3 in)
Depth:	2.5 cm (1 in)
Length:	10 cm (4 in)
Weight:	<0.5 kg (<1 lb)

4. Configuration

4.1 Base Station Requirements for RavenXTG

PC running Campbell Scientific's LoggerNet or PC400 software, with access to the Internet.

4.2 Datalogger Site Equipment

- RavenXTG modem with power cable (included with modem).
- Datalogger—21X, CR510, CR10(X), CR23X, CR7, CR1000, CR5000, CR3000, CR800.
- Modem Interface

If connecting to CS I/O port:

SC105 or SC932A Interface—connects the modem to the 21X, CR510, CR10(X), CR7, or other dataloggers' CS I/O port.

The SC105 must be configured for use with the modem using the Device Configuration Utility. Settings should be:

CS I/O Mode: SDC Address 7

RS-232 Mode: Modem

Baud Rate: 115.2K or 9600 baud depending on datalogger model
8 data bits, 1 stop bit, no parity

If connecting to RS-232 port:

PN 18663 Null Modem Cable—connects the modem to the CR23X, CR3000, CR800, CR2XX, CR1000, or CR5000 RS-232 port.

- PN 14394 Raven Mounting Kit—includes mounting hardware for securing the modem to below-referenced environmental enclosure and a 9-pin male to 9-pin female cable.
- Antenna—the following antennas are available from Campbell Scientific. Contact a Campbell Scientific applications technician for help in determining the best antenna for your application.

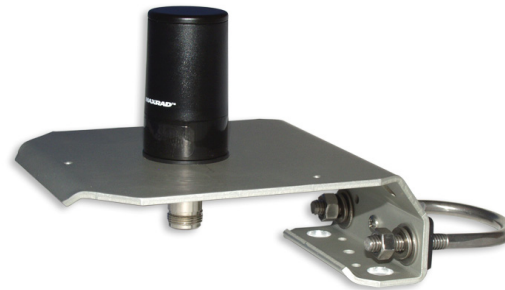
- The **20679** is a dual-band, omnidirectional antenna for our CDMA and GPRS/EDGE digital-cellular modems. It covers both the 800-MHz band and the 1.9-GHz band. For the 800-MHz band, the 20679 provides a 0-dBd gain. For the 1.9-GHz band, the 20679 provides a 3-dBd gain. This antenna is recommended for locations where cellular coverage is strong.

The 20679 includes a mount/u-bolt assembly that allows the antenna to be mounted to a mast, crossarm, or user-supplied pole (outer diameter of up to 3.8 cm (1.5 in)).

- The **18285** 1 dBd omnidirectional antenna. This antenna is dual band, covering both the 800 MHz and 1.9 GHz bands, and is strongly recommended where cellular coverage is strong. The 18285 includes a mount/u-bolt assembly for attaching the antenna to a mast, post, or crossarm up to 3.8 cm (1.5 in) in diameter.
- The **14454** 9dBd Yagi Antenna is a higher gain antenna that should be “aimed” at the service provider’s antenna. The 14454 is a 800 MHz antenna and bracket/u-bolt assembly for attaching the antenna to a mast or post. This antenna is recommended for fringe areas that require a higher gain antenna.
- The **21831** Half-Wave Dipole Whip Antenna is a lower gain antenna used in transmitting short distances. It is an 800 MHz cellular antenna that terminates in a SMA Male connector for attachment to the modem. This antenna is intended for use inside the enclosure. Please note that the backplate of the enclosure is a grounded plane. If it is interposed between the antenna and the cell tower, it may attenuate the strength of the transmission signal. Simply turning the enclosure 90 to 180 degrees on its mounting mast may solve weak transmission issues.



PN 20679 Omni Directional Antenna



PN 18285 1 dBd Omni Directional Antenna



PN 14454 9dBd Directional Yagi Antenna



PN 21831 Half-Wave Dipole Whip Antenna

FIGURE 4-1. Antennas for use with the Raven modems

- Power Supply (see power considerations).
- Environmental Enclosure—ENC10/12, ENC12/14, or ENC16/18.

4.3 Wiring and Connections

4.3.1 Modem Connections Using PN 18663 Null Modem Cable

PN 18663 Null Modem Cable is used to connect the modem to the CR23X, CR3000, CR800, CR2XX, CR1000 or CR5000 RS-232 port (not compatible with the 21X, CR510, CR10X, or CR7 dataloggers).

Wiring:

Red 12V (or
switched 12V)

Black G

White Not Used

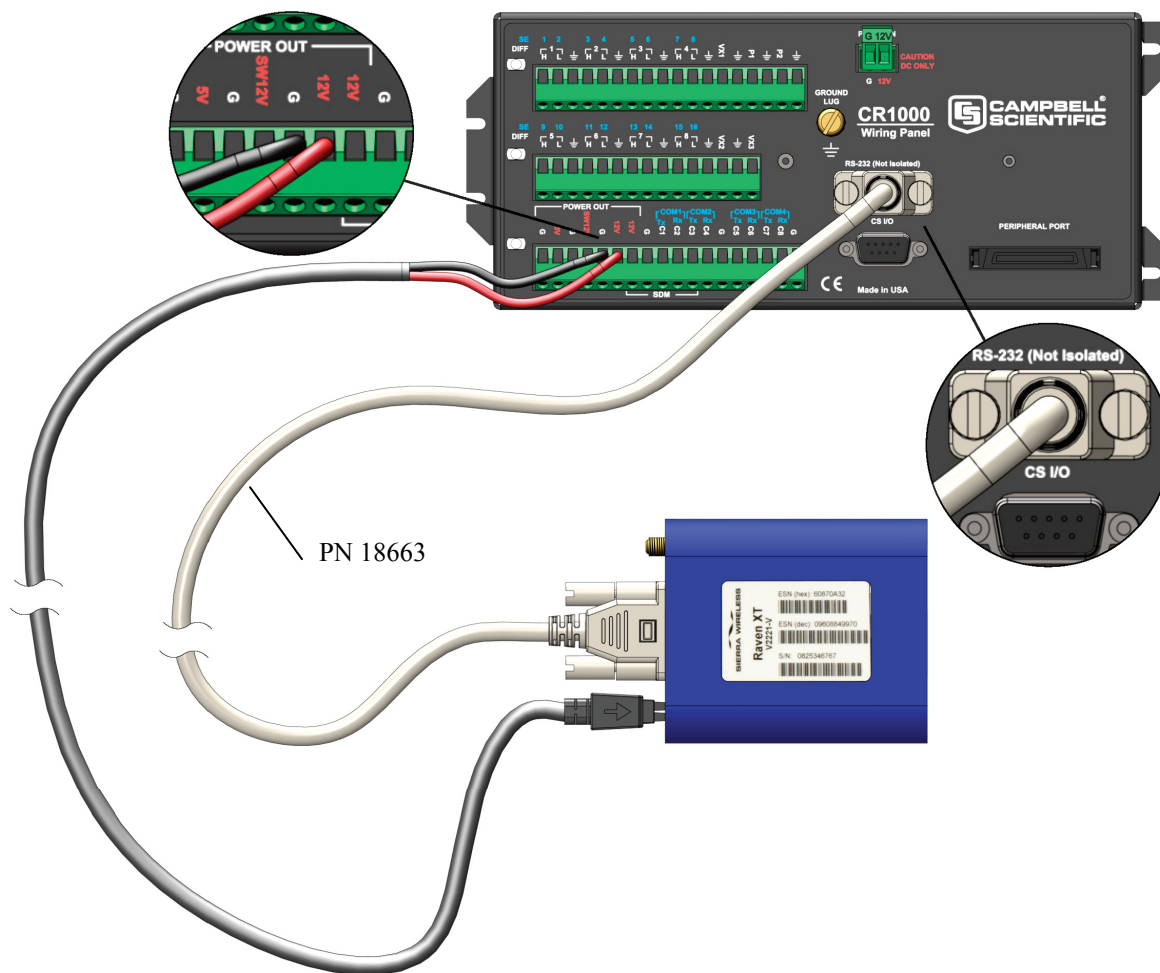


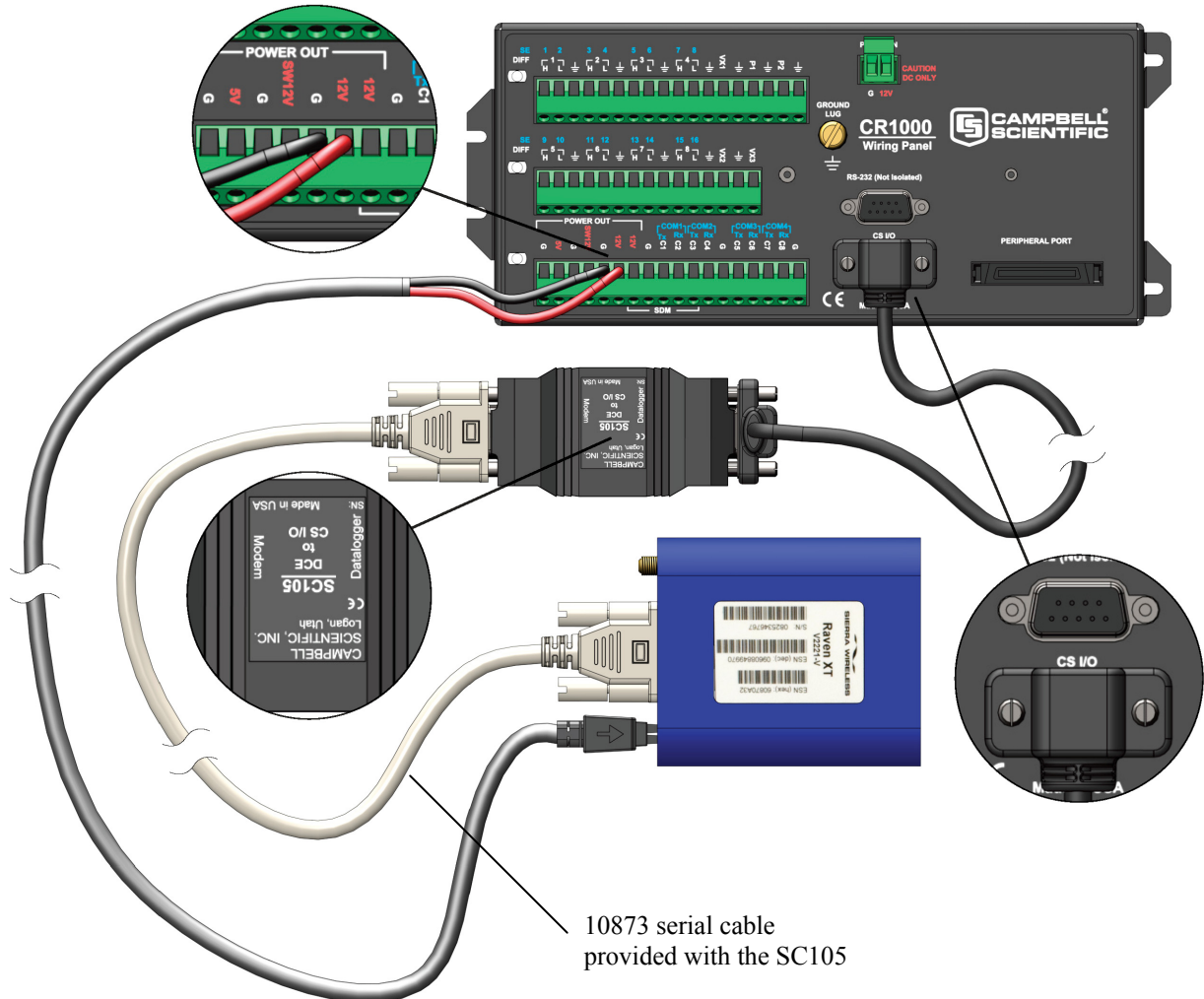
FIGURE 4-2. Connections using PN 18663 Null Modem Cable

4.3.2 Modem Connections Using the SC105

The SC105 interface is used to connect the modem to a datalogger's CS I/O port, and is recommended for dataloggers with the PakBus operating system.

Wiring:

Red 12V (or switched 12V)
 Black G
 White Not Used



SC105 Settings:

CS I/O Mode: SDC Address 7
 RS-232 Mode: Modem
 Baud Rate: 115.2K or 9600 baud depending on datalogger model
 8 data bits, 1 stop bit, no parity

FIGURE 4-3. Connections using the SC105

4.3.3 Modem Connections Using the SC932A

The SC932A interface is used to connect the modem to the CS I/O port, and is recommended for dataloggers with the mixed-array operating system (e.g., the CR10X).

Wiring:

Red 12V (or switched 12V)
Black G
White Not Used

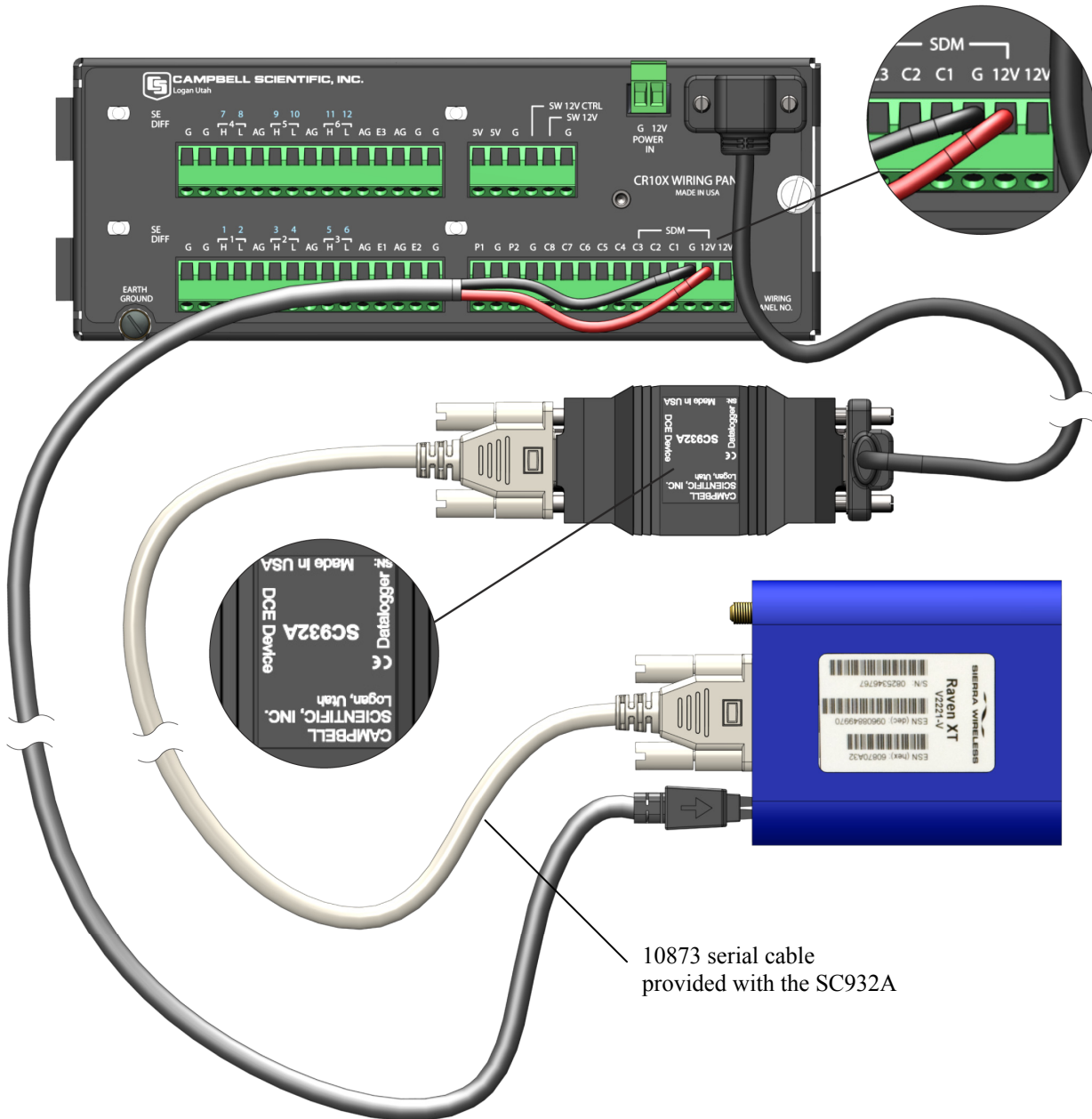


FIGURE 4-4. Connections using the SC932A

4.4 Power Considerations

A power cable included with the modem connects to the datalogger's 12 V or switched 12 V terminal. Connection to the switched 12 V terminal allows the datalogger to switch power to the modem during scheduled transmission intervals if desired. Connect the red lead wire to 12 V for constant power and to SW12 for program-controlled power, and the black lead to G (ground). The white wire lead has no function and can be ignored.

When using the switched 12 V terminal, the modem can typically be powered with a BP12 battery, CH100 charger/regulator, and SP10 solar panel.

4.5 Automatic Provisioning (Activation)

NOTE

It is recommended that the modem be provisioned and tested in the office (assuming there is cellular coverage) rather than in the field.

One of the special features of your RavenXTG is the ability to activate itself automatically. When you first power on the RavenXTG, it will check to see if it has been activated with account data. If it finds that it has not yet been activated, the RavenXTG will attempt to retrieve the account data from the AT&T network using Over-the-Air Service Provisioning (OTASP).

CAUTION

You need to have an account with AT&T before you attempt automatic activation. If you have not ordered an account from AT&T for your RavenXTG, it will not succeed at activating.

1. Attach the antenna to your RavenXTG.
2. Plug the RavenXTG into power.
3. While the LED lights cycle from the outside to the inside, the RavenXTG is attempting to download its account information. The download process may take one to two minutes to complete.

CAUTION

Do not move your RavenXTG while it is being programmed.

4. When the Network lights illuminate, your RavenXTG has successfully completed OTASP and is registered on the AT&T network.

Indicator Lights

When your RavenXTG is connected to power and an antenna, there is a specific pattern to the lights to indicate its operation mode.



- **Network**—Indicates a successful connection to the cellular network with an IP address given and a channel acquired.
- **Signal**—Light shows the strength of the signal and may be nearly solid (strong signal) or flashing (weaker signal). A slow flash indicates a very weak signal.
- **Activity**—Lights will flash as data is transferred to and from the PinPoint modem on the remote network.
- **Power**—Indicates the power adapter is connected and there is power getting to the RavenXTG.
- The **Reset button** (on the left side of the RavenXTG) has two functions. If it is quickly depressed and released, the modem will simply power cycle the internal hardware. If, however, the reset is depressed and held for several seconds (count to 10 slowly and wait for the power light to go off after the light pattern stops), the ALEOS configuration settings will return to the factory defaults.

Light Patterns

The LEDs on the front of the modem will respond in different patterns to indicate modem states.

- **Normal**—Each LED, mentioned above, lit as applicable.
- **Start up**—The LEDs will cycle from left to right.
- **PassThru Mode**—Network and Signal LEDs will blink in tandem. The Activity LED will blink when transmitting or receiving data.
- **SOS**—The Network LED blinks.
- **Configuration Reset**—The LEDs will cycle left to right and then right to left 4 times.

- **Authentication Failure**—The Network, Signal, and Activity LEDs blink every 2 seconds. Contact the cellular provider and have the account information verified, and verify the modem is located in an area covered by cellular service.
- **Data Retry**—The Network, Signal, and Activity LEDs blink every 3 seconds.

5. Using AceManager to Program the Modem

After the RavenXTG has been provisioned, certain settings have to be changed for the modem to be compatible with CSI dataloggers. The recommended way to change the settings is to send a template file to the modem using the AceManager utility.

The AceManager utility is on the CD that ships with the RavenXTG modem and is also available from Sierra Wireless (www.sierrawireless.com/support).

To install AceManager from the Sierra Wireless CD, click on the “AceManager” link under Modem Utilities and follow the prompts. Once the application has been installed, it can be run from the Windows Start menu or from the icon on the desktop.

Template files from CSI’s website (www.campbellsci.com/downloads) are used to configure the RavenXTG modem to function as a serial server or in Point-to-Point protocol (PPP):

Template files for the RavenXTG	Description
RavenXTG GPRS/EDGE Template 115200	Serial server mode, for newer dataloggers* that support 115200 baud, recommended for most applications
RavenXTG GPRS/EDGE Template 9600	Serial server mode, for older dataloggers** that support 9600 baud
RavenXTG GPRS/EDGE PPP Template 115200	PPP mode, for newer dataloggers*

* CR1000, CR800, CR3000

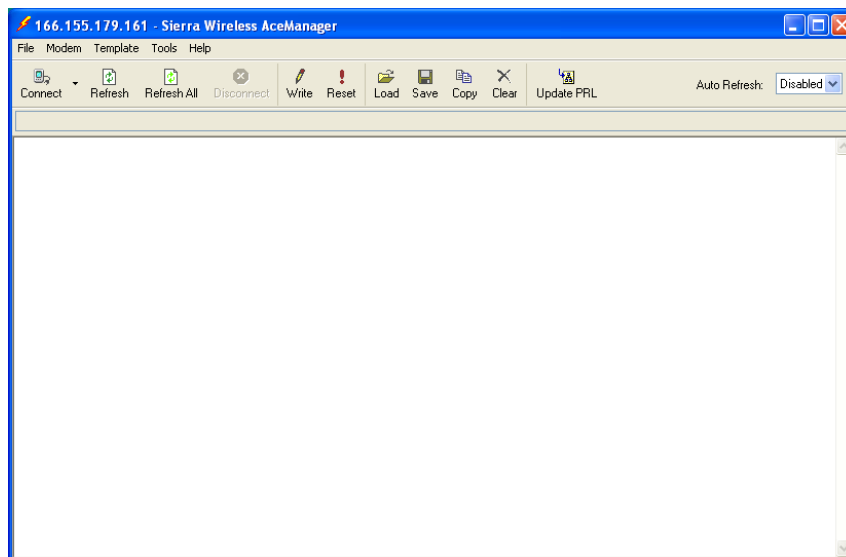
** CR200(X), CR10(X), CR510, CR500, 21X, and CR7

As a serial server, the modem has an IP address and port number (3001) for the RavenXTG’s RS-232 port. LoggerNet sends data via TCP/IP over the Internet to the datalogger. The modem removes the data from the TCP packet and sends the data out the RS-232 port to the datalogger. Returning data is put into a TCP packet by the modem and sent back to LoggerNet.

When configured as PPP, the RavenXTG functions as a router, routing TCP/IP communications to the IP stack of the datalogger. PPP enables the datalogger to send/receive messages via email, HTTP, FTP to and from the datalogger, and it allows concurrent communications between networked dataloggers and LoggerNet.

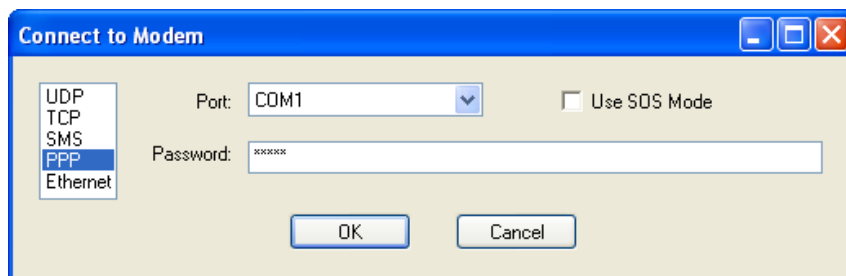
Connect the RavenXTG to a COM port on the PC with a direct RS-232 cable. Also connect the antenna and 12V power.

Run AceManager to get the following screen:



Click the **Connect** icon in the Configuration Panel to open the connection options dialogue box. Select PPP and choose the COM port the modem is connected to. Do not change the Password (the default password is 12345). Click OK to continue.

If the modem has been configured for “PPP” (see Appendix C, *Configuring the RavenXTG Modem for PPP*), then you may have to check the “Use SOS Mode” box.



Click the **Load** icon in the Configuration Panel. When prompted for a template file name, select “RavenXTG GPRS/EDGE Template 115200”, “RavenXTG GPRS/EDGE Template 9600”, or “RavenXTG GPRS/EDGE PPP Template 115200”. The following screens show the settings for the Miscellaneous and Serial settings after the template file has been loaded.

COM1 SOS - Sierra Wireless AceManager

File Modem Template Tools Help

Connect Refresh Refresh All Disconnect Write Reset Load Save Copy Clear Update PRL Auto Refresh: Disabled

Template "C:\AirLink\avengprgs_115200.xml" loaded

GROUPS	MODEM DATA			PRINTABLE VIEW
	AT	Name	Value	
INFO	*NETIP	Network IP	166.213.213.176	
	*NETSTATE	Network State	Network Ready	
	*NETCHAN	Channel	136	
	*NETRSSI	RSSI (dBm)	-81	
	*NETOP	Current Network Operator	Cingular, 310410	
	+ICCID	SIM ID	89014104211249699177	
	+CIMI	IMSI	310410124969917	
		Host Mode	PPP	
		Host Signl Level	DCD: HIGH DTR: HIGH DSR: HIGH CTS: HIGH RTS: HIGH	
		*NETERR	Network Error Rate	0
LOGGING		Network Bytes Sent	0	
		Network Bytes Rcvd	1758	
		Host Serial Bytes Sent	9344	
		Host Serial Bytes Rcvd	2506	
TELEMETRY		Network IP Packets Sent	0	

COM1 SOS - Sierra Wireless AceManager

File Modem Template Tools Help

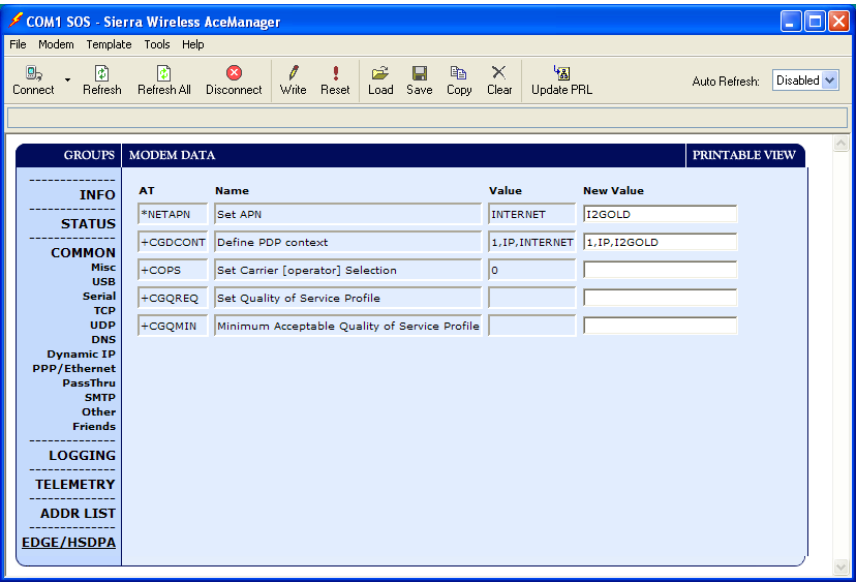
Connect Refresh Refresh All Disconnect Write Reset Load Save Copy Clear Update PRL Auto Refresh: Disabled

Template "C:\AirLink\avengprgs_115200.xml" loaded

GROUPS	AT	Name	Value	New Value
COMMON	S23	Configure Serial Port	115200,8N1	115200,8N1
	\Q	Serial Port Flow Control	0	0=None
	S50	Data Forwarding Timeout	1	1
	S51	Data Forwarding Character	0	0
	E	DB9 Serial Echo	0	
	E	USB Serial Echo	1	
	E	Telnet Echo	1	
	V	AT Verbose Mode	1	1-Verbose
	&D	DTR Mode	0	0-Ignore DTR
	S211	DTR Mode	1	1-Ignore DTR
LOGGING	&S	Assert DSR	1	1-In Data Mode
	&C	Assert DCD	1	1-In Data Mode
	*CTSE	Enable CTS to Indicate Network Coverage	0	0-Disabled
	Q	Quiet Mode	0	0-OFF
TELEMETRY	X	Call Progress Result Mode	0	0-OFF
	*NUMTOIP	Convert 12 digit Number to IP	0	0-Use as Name

Change “AT Verbose Mode” to “Numeric” for use with CR10(X), CR510, and CR23X dataloggers.

Click on **EDGE/HSDPA** Group to get the following screen:



For a data account with the I2GOLD APN, enter the APN as shown in the screen above. The example is for an APN = “I2GOLD”.

Account options prior to the “I2Gold” included a data account with “Feature Code G821”. An AT&T account with Feature Code G821 is configured for an Access Point Name (APN) = “internet”. Enter “internet” in the New Value field for “*NETAPN” and “1,IP,internet” in the New Value field for +CGDCONT.

After the template file has been loaded, and the APN entered, click the **Write** icon to save the changes in the modem.

Click the **Reset** icon to restart the modem. The other ways to reset the modem are by pressing the reset button on the front of the modem or removing the power from the modem.

Click the **Disconnect** icon to terminate communications with the modem.

WARNING

Unless you Write the commands, the changes made in New Value will not be sent to the modem. For some commands unless you Reset the modem, the newly written values will not take effect.

5.1 Configuring the RavenXTG for Dynamic IP

Accounts with the I2GOLD APN are provided with a Static IP address, and do not require the settings described in Section 5.1, *Configuring the RavenXTG for Dynamic IP*. Accounts without the I2GOLD APN may be provided with a Dynamic IP address, which will require the IP Manager settings described below.

Dynamic IP addresses are granted only when a modem or other device is connected. The address can change each time the modem or device reconnects to the network.

IP Manager is a free service provided by Sierra Wireless for the RavenXTG to translate a dynamic IP address into a fully qualified domain name so it can be contacted directly on the Internet. IP Manager translates a dynamic IP address to a fully qualified domain name so you can contact your RavenXTG by name as if it had a static IP.

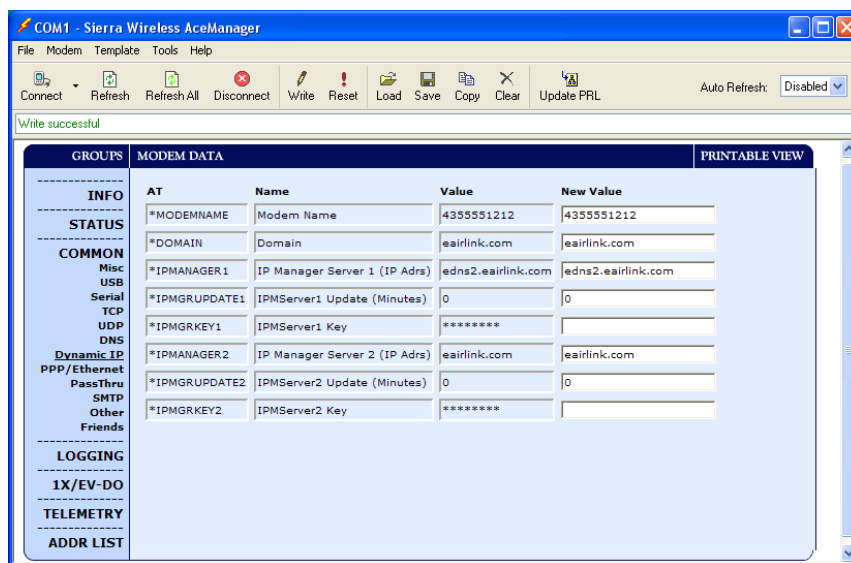
If the RavenXTG is configured for Dynamic IP, when the RavenXTG first connects to the Internet, it sends an IP change notification to IP Manager. IP Manager will acknowledge the change and update the dynamic DNS record. The changed IP address will then be the address for the RavenXTG's configured name. Once the RavenXTG's IP has been updated in IP Manager, it can be contacted via name.

AceManager is used to configure the Dynamic IP settings in your RavenXTG so that it will use IP Manager as described below.

Connect with modem using AceManager. Select the Dynamic IP group to configure your modem to use IP Manager.

To configure your Sierra Wireless modem to be addressed by name, the modem needs to have four elements configured.

Enter names in the New Value fields for **MODEMNAME**, **DOMAIN**, **IPMANAGER1**, **IPMANAGER2**, and **IPMGRUPDATE1**.



1. Modem name: A unique name for the modem (the 10-digit MDN number is recommended).
2. Domain: The domain name to be used by the modem (eaalink.com).
3. IP Manager IP Address: The IP or domain name of the dynamic DNS server which is running IP Manager.

IPMANAGER1: edns2.eaalink.com
IPMANAGER2: eaalink.com
4. IP Manager update interval: How often you want the address sent to IP Manager. If this is set to zero, the modem will only send an update if the IP changes (i.e., if the modem is reset or is assigned a different IP). The value can be set from 0 to 255 minutes.

Restrictions for modem name:

- Must begin with a letter or number
- Can include a hyphen (-)
- Cannot contain spaces
- Must be no longer than 20 characters total

Click the **Write** icon to save the changes.

Click the **Reset** icon to restart the modem.

Click the **Disconnect** icon to terminate communications with the modem.

6. LoggerNet/PC400 Software Setup

The Loggernet “Device Map” is configured from the “Setup” button on the LoggerNet Toolbar.

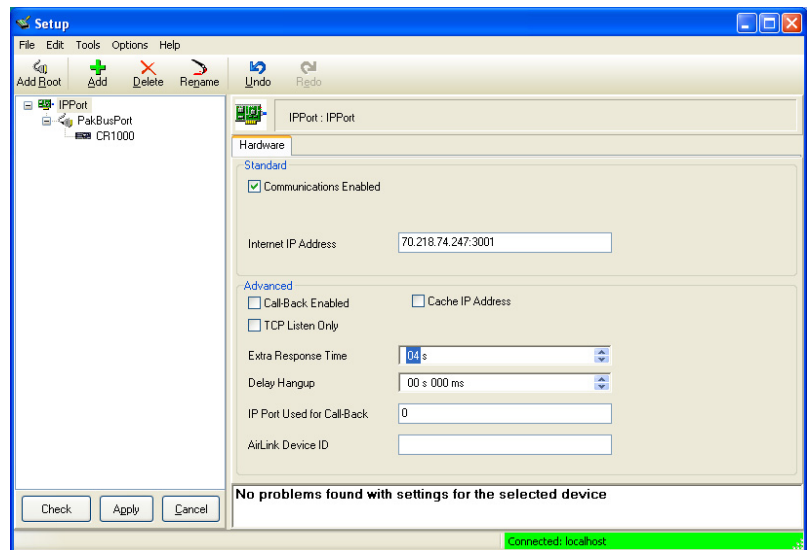
NOTE

Setup has two options, “EZ (simplified)” and “Standard”. Click on the “View” menu item at the top of the Setup Screen, and select “Standard” view.

From the Loggernet Toolbar, click Main | Setup, and configure the Device Map as described below.

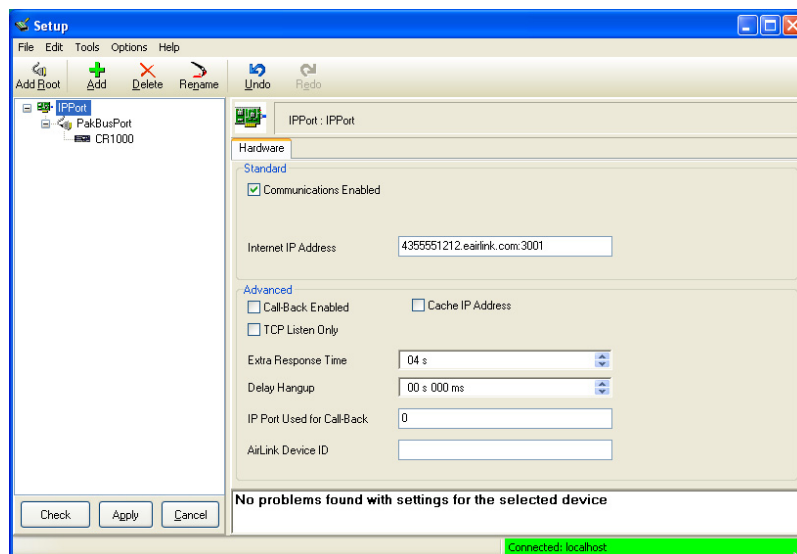
1. Select Add Root | IPPort.
2. Add a datalogger to the IPPort (PakBus dataloggers; e.g., the CR1000, require a PakBusPort).
3. On the IPPort page, add the IP address or Domain Name and the Port number (the RavenXTG template file configures the port to be 3001). Add four seconds of extra response time.

Example settings for a “Static IP” address:



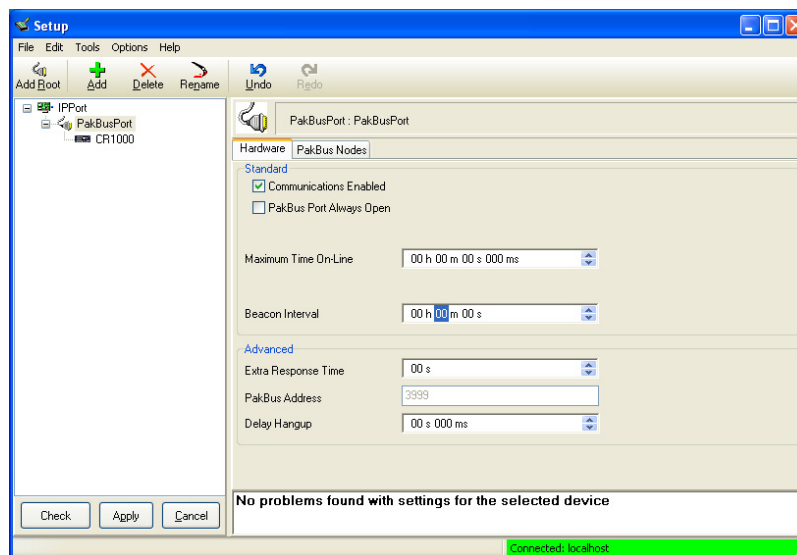
Preceding zeros are not entered in the Internet IP Address (e.g., 070.218.074.247 is entered as 70.218.74.247). Follow the IP address with “:3001”, which is the port number (set by the template file). For modems configured as “PPP” the port number is “:6785”.

Example settings for a “Dynamic IP” address:

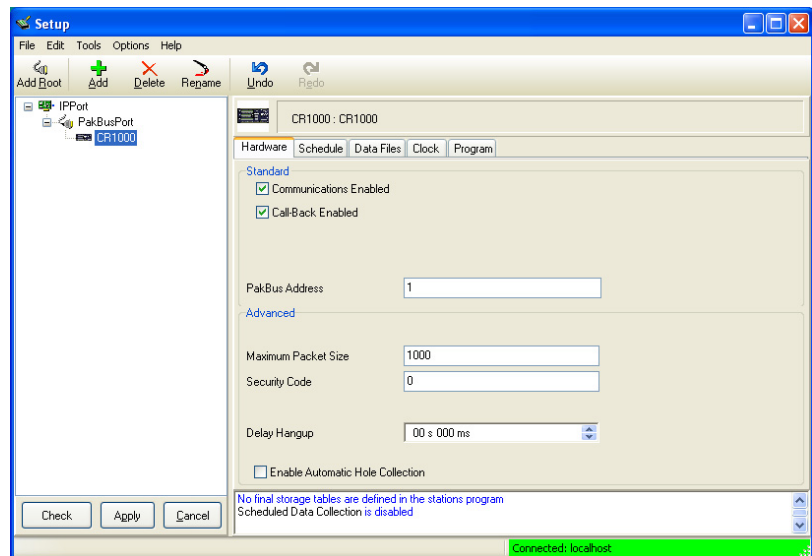


For a Dynamic IP using Sierra Wireless’s IP Manager, enter the Internet IP address as: xxxx.yyyy:3001, where xxxx is the modem name, yyyy is the Domain name, and 3001 is the port number. For modems configured as “PPP” the port number is “:6785”.

4. For PakBus dataloggers, leave the default settings on the PakBusPort page. “PakBus Port Always Open” should not be checked.

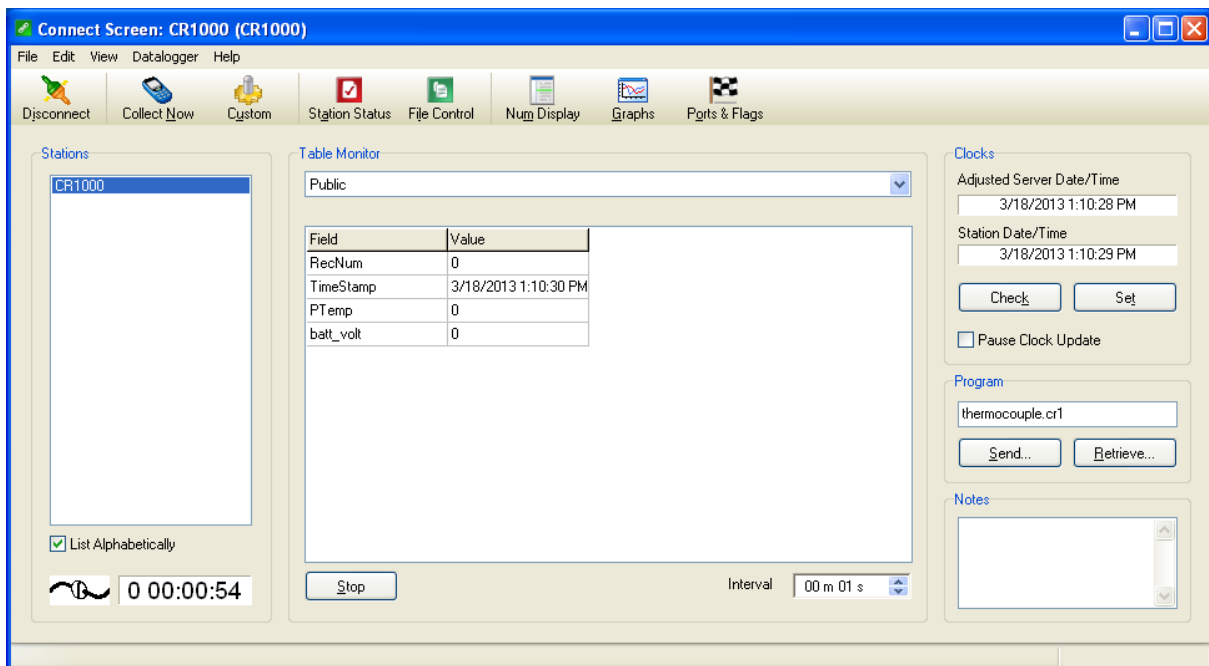


5. For PakBus dataloggers, set the PakBus address to match that of the datalogger (default address in the datalogger is 1). Click the “Apply” button to save the changes.



6.1 Test the Cellular Connection

After the Device Map has been configured, test the cellular connection using the “Connect” screen as shown below. Click on the appropriate station, then click the “Connect” button to initiate a call to the datalogger. If the call is successful, the connectors at the bottom of the screen will come together, and time information from the datalogger displayed will be the “Station Date/Time” field. If the connection fails, a “Communications Failure” message is displayed. Troubleshooting procedures can be found in Section 7, *Troubleshooting*, and Appendix E, *Troubleshooting Flowchart*.



7. Troubleshooting

NOTE

Please refer to Appendix E, *Troubleshooting Flowchart*, for additional troubleshooting procedures.

If LoggerNet/PC400 software is unable to establish a connection with the modem:

1. Check the GPRS/EDGE cellular account information, and verify there is GPRS/EDGE coverage at the site. Dynamic IP accounts require a Dynamic Domain Name Server (DDNS) (Section 5, *Using AceManager to Program the Modem*).
 - a. Modem settings have to be changed, and the APN number entered, using AceManager (Section 5, *Using AceManager to Program the Modem*). After the RavenXTG GPRS/EDGE template file has been loaded, you can verify settings in the Status, Misc, Serial, and GPRS/EDGE groups have been configured as shown below.

COM1 SOS - Sierra Wireless AceManager

File Modem Template Tools Help

Connect

Refresh

Refresh All

Disconnect

Write

Reset

Load

Save

Copy

Clear

Update PRL

Auto Refresh: Disabled

Template "C:\airlink\ravengprs_115200.xml" loaded

GROUPS	MODEM DATA			PRINTABLE VIEW
INFO	AT	Name	Value	
	*NETIP	Network IP	166.213.213.176	
	*NETSTATE	Network State	Network Ready	
	*NETCHAN	Channel	142	
	*NETRSSI	RSSI (dBm)	-83	
	*NETOP	Current Network Operator	Cingular, 310410	
	+ICCID	SIM ID	89014104211249699177	
	+CIMI	IMSI	310410124969917	
		Host Mode	PPP	
		Host Signl Level	DCD: HIGH DTR: HIGH DSR: HIGH CTS: HIGH RTS: HIGH	
STATUS	*NETERR	Network Error Rate	0	
		Network Bytes Sent	0	
		Network Bytes Rcvd	0	
		Host Serial Bytes Sent	390	
		Host Serial Bytes Rcvd	660	
		Network IP Packets Sent	0	
		Network IP Packets Rcvd	0	
		Host IP Packets Sent	2	
		Host IP Packets Rcvd	3	
	COMMON	Misc		
USB				
Serial				
TCP				
UDP				
DNS				
Dynamic IP				
PPP/Ethernet				
PassThru				
SMTP				
LOGGING	Other			
	Friends			
TELEMETRY				
ADDR LIST				
EDGE/HSDPA				

- b. Check the Network light. Network — indicates a successful connection to the cellular network with an IP Address given and a channel acquired.
- c. Make sure the modem has sufficient power.
- d. Check the signal strength using AceManager (make sure your antenna is properly connected and oriented). Signal strength should be in the -51 to -90 range (-51 is a strong signal, -90 is a weak signal).
- e. Make sure you have digital (not analog) coverage. For the RavenXTG this should be a GPRS/EDGE account.

- f. If you have a Static IP account, verify the Static IP Address. Preceding zeros in the IP address are not entered in LoggerNet/PC400.
 - g. If you have a Dynamic IP account, you will need to have a DDNS (dynamic domain name server) name that LoggerNet can reference to make the connection (Section 5.1, *Configuring the RavenXTG for Dynamic IP*).
2. Connect with the modem through the serial port using AceManager.
 - a. If the modem has been configured for “PPP” (see Appendix C, *Configuring the RavenXTG Modem for PPP*), then you may have to check the “Use SOS Mode” box.
 - b. From the “Status” group, make sure the “Network State” is “Network Ready”, and note the “Network IP” address. This is the current IP address for the modem (a dynamic IP address will change each time the modem is reset). Try connecting to this IP address using LoggerNet. If LoggerNet connects with the IP address, but not with the modem name.domain name, then there may be a problem with the Dynamic IP setup in the modem (Section 5.1, *Configuring the RavenXTG for Dynamic IP*).

The screenshot shows the Sierra Wireless AceManager software window. The title bar reads "COM1 - Sierra Wireless AceManager". The menu bar includes "File", "Modem", "Template", "Tools", and "Help". The toolbar contains icons for "Connect", "Refresh", "Refresh All", "Disconnect", "Write", "Reset", "Load", "Save", "Copy", "Clear", and "Update PRL", along with an "Auto Refresh" dropdown set to "Disabled".

The main window is divided into two panes. The left pane, titled "GROUPS", contains a tree view with the following categories: INFO, STATUS, COMMON, Misc, USB, Serial, TCP, UDP, DNS, Dynamic IP, PPP/Ethernet, PassThru, SMTP, Other, Friends, LOGGING, 1X/EV-DO, TELEMETRY, and ADDR LIST. The "STATUS" group is currently selected.

The right pane, titled "MODEM DATA", displays a table of modem parameters. A "PRINTABLE VIEW" button is located in the top right corner of this pane.

AT	Name	Value
*NETIP	Network IP	70.192.46.181
*NETSTATE	Network State	Network Dormant
*NETCHAN	Channel	630
*NETRSSI	RSSI (dBm)	-72
	Host Mode	PPP
	Host Signl Level	DCD: HIGH DTR: HIGH DSR: HIGH CTS: HIGH RTS: HIGH
*NETERR	Network Error Rate	255
	Network Bytes Sent	262
	Network Bytes Rcvd	348
	Host Serial Bytes Sent	368
	Host Serial Bytes Rcvd	660
	Network IP Packets Sent	4
	Network IP Packets Rcvd	4
	Host IP Packets Sent	2

- c. Select the “Serial” Group, and make sure the “AT Verbose Mode” is set to “Numeric” for use with the CR10(X), CR510, and CR23X dataloggers, or “Verbose” for other dataloggers (e.g., CR1000).

The screenshot shows the Sierra Wireless AceManager interface. The 'Serial' group is selected in the left-hand menu. The 'MODEM DATA' table is displayed, showing various settings for the serial port. The 'AT Verbose Mode' is set to '1-Verbose'.

GROUPS	AT	Name	Value	New Value
INFO	S23	Configure Serial Port	115200,8N1	115200,8N1
STATUS	\Q	Serial Port Flow Control	0	0=None
COMMON	S50	Data Forwarding Timeout	1	1
Misc	S51	Data Forwarding Character	0	0
USB	E	DB9 Serial Echo	0	
TCP	E	USB Serial Echo	1	
UDP	E	Telnet Echo	1	
DNS	V	AT Verbose Mode	1	1-Verbose
Dynamic IP	&D	DTR Mode	0	0-Ignore DTR
PPP/Ethernet	S211	DTR Mode	1	1-Ignore DTR
PassThru	&S	Assert DSR	1	1-In Data Mode
SMTP	&C	Assert DCD	1	1-In Data Mode
Other	*CTSE	Enable CTS to Indicate Network Coverage	0	0-Disabled
Friends	Q	Quiet Mode	0	0-OFF
LOGGING	X	Call Progress Result Mode	0	0-OFF
TELEMETRY	*NUMTOIP	Convert 12 digit Number to IP	0	0-Use as Name
ADDR LIST				
EDGE/HSDPA				

The “RavenXTG GPRS/EDGE Template 9600” template file sets the baud rate to 9600, which is the maximum baud rate for the CR10X and older dataloggers. For newer dataloggers, the baud rate can be changed to the highest baud rate supported by the datalogger (e.g. 115200 baud for the CR1000).

NOTE

Baud rate changes require the modem to be reset before the change takes affect. Click the **Reset** icon in AceManager to the reset the modem and implement the change.

The screenshot shows the Sierra Wireless AceManager interface. The 'Serial' group is selected in the left-hand menu. The 'MODEM DATA' table is displayed, showing various settings for the serial port. The 'AT Verbose Mode' is set to '1-Verbose'.

GROUPS	AT	Name	Value	New Value
INFO	*NETAPN	Set APN	INTERNET	I2GOLD
STATUS	+CGDCONT	Define PDP context	1,IP,INTERNET	1,IP,I2GOLD
COMMON	+COPS	Set Carrier [operator] Selection	0	
Misc	+CGQREQ	Set Quality of Service Profile		
USB	+CGQMIN	Minimum Acceptable Quality of Service Profile		
TCP				
UDP				
DNS				
Dynamic IP				
PPP/Ethernet				
PassThru				
SMTP				
Other				
Friends				
LOGGING				
TELEMETRY				
ADDR LIST				
EDGE/HSDPA				

Verify the APN has been entered in the NETAPN and +CGDCONT fields as shown above (where I2GOLD is the APN).

If the modem answers but you do not get a connection to the datalogger:

1. Check your connection to the datalogger.

- a. An SC932A or SC105 interface is required to connect the modem to a datalogger's CS I/O port (Section 4, *Configuration*). The default settings for SC105 (OS > 4) can be used with the RavenXTG when the modem is configured for 115200 baud (baud rate is set by the template file).

Baud rate of the SC105 must match the baud rate in the modem (which has to be supported by the datalogger). SC105 settings for use with the RavenXT are listed below, which are configured using the DevConfig utility.

SC105 settings for the RavenXT:

CS I/O Mode: SDC Address 7

RS-232 Mode: Modem

Baud Rate: 115.2K or 9600 baud depending on datalogger model
8 data bits, 1 stop bit, no parity

Make sure the modem is connected to the "DCE Device" connector on the SC932A, or the "Modem" connector on the SC105.

- b. A null modem cable is required to connect the modem to a datalogger's RS-232 port. No other interface is required.

2. Check your LoggerNet setup.

- a. Make sure the port number at the end of the IP address matches the port number of the RavenXTG (e.g., 3001, see FIGURE 7-1).

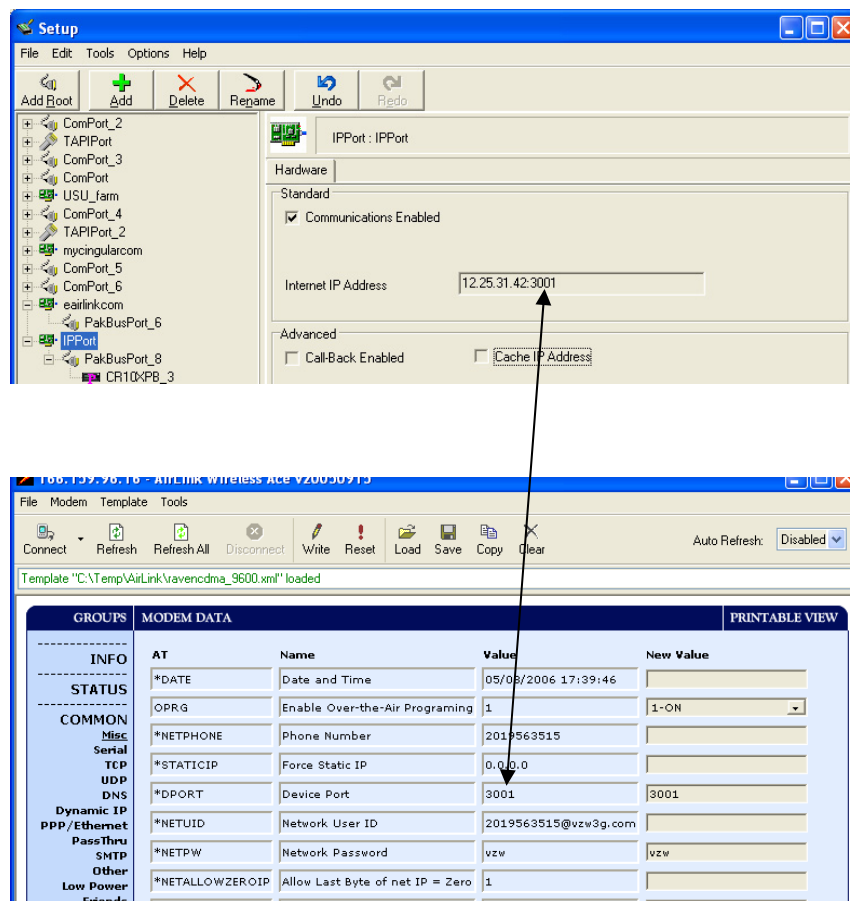


FIGURE 7-1. Device Port configuration

- b. Try adding a few seconds to the extra response time on the IP Port in LoggerNet (you should not need more than 5 seconds).
- c. If you are trying to communicate to a PakBus datalogger:
 - i. Verify the PakBus address in the setup screen matches that of the datalogger.
 - ii. If you have multiple PakBus networks/ports setup in LoggerNet, uncheck the 'PakBus Port Always Open' options on all PakBus ports.

3. Use AceManager to check modem communications with datalogger.

The modem's "Host Serial Bytes Sent" and "Host Serial Bytes Received" windows can indicate whether or not the modem is communicating with the datalogger.

Establish a connection with the modem through the cellular network using AceManager (click on the Modem menu item, Connect, UDP. Enter the IP address, and click OK). Go to the Status group and note the "Host Serial Bytes Sent" and "Host Serial Bytes Received" values (FIGURE 7-2). Try connecting with the datalogger using LoggerNet/PC400. If a connection cannot be established, close LoggerNet and reconnect with AceManager and compare the current values with the previous values.

If the values are the same, the modem is not attempting to make a connection with the datalogger. Check that the GPRS/EDGE_XXX.xml template file has been loaded (Section 5, *Using AceManager to Program the Modem*).

If the "Host Serial Bytes Sent" increased, the modem attempted to connect to the datalogger, but the response from the datalogger did not make it back to the modem. Check the interface between the modem and the datalogger (Section 4.2, *Datalogger Site Equipment*).

If both values incremented, the modem and the datalogger are communicating. Try adding some extra response time in LoggerNet.

NOTE

Baud rate changes require the modem to be reset before the change takes affect. Click the Reset icon in AceManager to the reset the modem and implement the change.

GROUPS	AT	Name	Value
INFO	*NETIP	Network IP	166.213.213.176
STATUS	*NETSTATE	Network State	Network Ready
COMMON	*NETCHAN	Channel	142
Misc	*NETRSSI	RSSI (dBm)	-83
USB	*NETOP	Current Network Operator	Cingular, 310410
Serial	+ICCID	SIM ID	89014104211249699177
TCP	+CIMI	IMSI	310410124969917
UDP		Host Mode	PPP
DNS		Host Signal Level	DCD: HIGH DTR: HIGH DSR: HIGH CTS: HIGH RTS: HIGH
Dynamic IP	*NETERR	Network Error Rate	0
PPP/Ethernet		Network Bytes Sent	0
PassThru		Network Bytes Rcvd	0
SMTP		Host Serial Bytes Sent	390
Other		Host Serial Bytes Rcvd	660
Friends		Network IP Packets Sent	0
LOGGING			
TELEMETRY			
ADDR LIST			
EDGE/HSDPA			

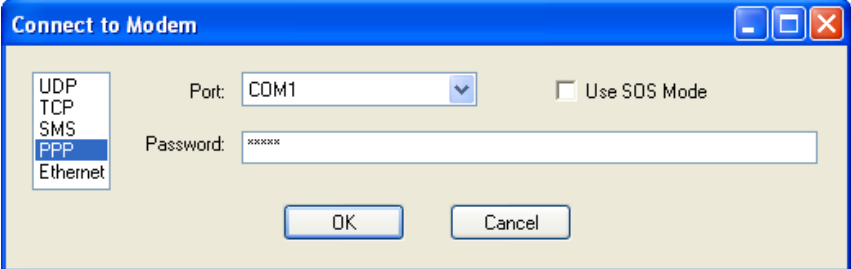
FIGURE 7-2. AceManager status page showing communications with modem

Appendix A. AceManager Setup without Template File

AceManager is used to program settings in the RavenXT modems to make the modems compatible with CSI dataloggers. Sierra Wireless CDMA and GPRS/EDGE template files to send the modems are available on the CSI website (www.campbellsci.com/downloads). The procedure for sending the template files is described in Section 5, *Using AceManager to Program the Modem*.

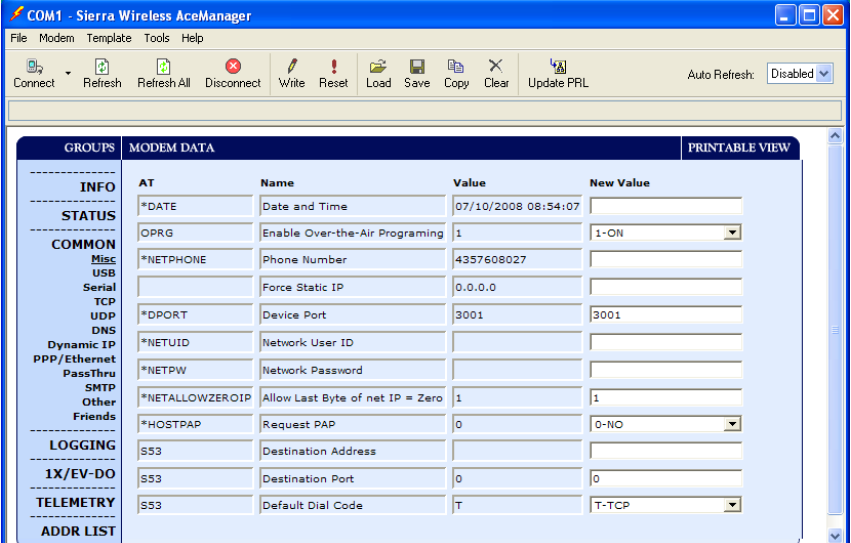
When the template files are not available, AceManager can be used to change the settings described below.

For a direct connection on a COM port use PPP.



The "Connect to Modem" dialog box shows a list of connection protocols on the left: UDP, TCP, SMS, PPP (selected), and Ethernet. The "Port" dropdown is set to "COM1". The "Password" field contains "xxxxxx". The "Use SOS Mode" checkbox is unchecked. "OK" and "Cancel" buttons are at the bottom.

Make a note of the Device port (*DPORT). The default is 12345 and we use 3001 in our template. Any valid port can be used. This is the port number used in LoggerNet to get to the datalogger.



The main window of Sierra Wireless AceManager for COM1. The menu bar includes File, Modem, Template, Tools, and Help. The toolbar contains buttons for Connect, Refresh, Refresh All, Disconnect, Write, Reset, Load, Save, Copy, Clear, and Update PRL. The "Auto Refresh" dropdown is set to "Disabled".

GROUPS	MODEM DATA				PRINTABLE VIEW
	AT	Name	Value	New Value	
INFO	*DATE	Date and Time	07/10/2008 08:54:07		
	OPRG	Enable Over-the-Air Programming	1	1-ON	
	*NETPHONE	Phone Number	4357608027		
		Force Static IP	0.0.0.0		
	*DPORT	Device Port	3001	3001	
	*NETUID	Network User ID			
	*NETPW	Network Password			
	*NETALLOWZEROIP	Allow Last Byte of net IP = Zero	1	1	
	*HOSTPAP	Request PAP	0	0-NO	
	LOGGING	S53	Destination Address		
S53		Destination Port	0	0	
S53		Default Dial Code	T	T-TCP	

- S23 — Configure Serial Port — The baud rate needs to be configured to match a valid datalogger baud rate. For a CR10X: 9600,8N1 and for a CR1000: 115200,8N1.
- \Q — Serial Port Flow Control — This should be set to None.
- V — AT Verbose Mode — Set this to Verbose for CR800, CR1000, CR3000; Numeric for CR10(X), CR510, CR23X.
- &D — DTR Mode — Set to Ignore DTR
- S211 — DTR Mode – Set to Ignore DTR

GROUPS	AT	Name	Value	New Value
INFO	S23	Configure Serial Port	115200,8N1	115200,8N1
	\Q	Serial Port Flow Control	0	0-None
	S50	Data Forwarding Timeout	1	1
	S51	Data Forwarding Character	0	0
	E	DB9 Serial Echo	0	
	E	USB Serial Echo	1	
	E	Telnet Echo	1	
	V	AT Verbose Mode	1	1-Verbose
	&D	DTR Mode	0	0-Ignore DTR
	S211	DTR Mode	1	1-Ignore DTR
TELEMETRY	&S	Assert DSR	1	1-In Data Mode
	&C	Assert DCD	1	1-In Data Mode
	*CTSE	Enable CTS to Indicate Network Coverage	0	0-Disabled

- S0 — TCP Auto Answer — Set to On
- TCPT — TCP Idle Timeout — Set to a reasonable value like 2 min.

GROUPS	AT	Name	Value	New Value
INFO	S0	TCP Auto Answer	1	1-ON
	S7	TCP Connect Timeout	30	30
	TCPT	TCP Idle Timeout	2	2
	TCPS	TCP Idle Timeout Secs	0	0-Minutes
	S221	TCP Connect Response Delay	0	0
	S60	Telnet Echo Mode	1	1-Local Echo
	*ENQ	Enable ENQ on TCP Connect	0	0-Disable

Appendix B. Installation of SIM Card in the RavenXTG

The Subscriber Identity Module (SIM) in the RavenXTG is a smartcard securely storing the key identifying a mobile subscriber. Generally, you will only need to install the SIM once in the life of the modem.

Installing the SIM

To install the SIM, you will only need a small Phillips head screw driver.

Opening the Case

1. Unplug the modem power and all cables.
2. Using a small Phillips head screw driver, remove the two screws on the back of the modem, set the faceplate aside.



FIGURE B-1. Modem faceplate

3. Remove the SIM from the card you obtained from your AT&T, and gently press the SIM card to secure in place as shown in the figure below.





4. Replace the faceplate; the installation of the SIM is complete.

Appendix C. Configuring the RavenXTG Modem for PPP

Settings in the RavenXTG and datalogger (CR800, CR1000, and CR3000), can be changed to configure the RS-232 serial ports for Point-to-Point protocol (PPP). When configured as PPP, the RavenXTG functions as a router, routing TCP/IP communications to the IP stack of the datalogger. PPP enables the datalogger to send/receive messages via email, HTTP, FTP to and from the datalogger, and allows concurrent communications between networked dataloggers and LoggerNet.

The default datalogger port number for PakBus/TCP communications is 6785. The datalogger will also respond to port 80 for HTTP, 23 for Telnet, and 21 for FTP. These ports can be disabled in the datalogger's configuration.

NOTE

After the RS-232 port on the modem has been configured as PPP, use AceManager with a TCP or UDP connection to establish communications with the modem. It may also be possible to connect with the modem through its RS-232 port using the "SOS" mode.

RavenXTG Settings for PPP Mode:

Download the "RavenXTG GPRS/EDGE PPP Template 115200" template file from www.campbellsci.com/downloads as described in Section 5, *Using AceManager to Program the Modem*. The template file configures the following settings in the "PPP/Ethernet" Group:

- HOSTPRIVMODE = 1
- HOSTPRIVIP = 192.168.13.100

This will configure the RavenXTG to use NAT (Network Address Translation). These may be the default values depending on the version of firmware in the modem.

COM1 - Sierra Wireless AceManager

File Modem Template Tools Help

Connect Refresh Refresh All Disconnect Write Reset Load Save Copy Clear Update PRL Auto Refresh: Disabled

Template "" loaded

GROUPS	MODEM DATA			PRINTABLE VIEW
	AT	Name	Value	New Value
INFO				
STATUS	*HOSTPRIVMODE	Host Public Mode	1	
COMMON	*HOSTPRIVIP	DHCP Starting IP	192.168.13.100	
Misc		DHCP Ending IP	192.168.13.150	
USB		DHCP network mask	255.255.255.0	
Serial	*HOSTPEERIP	Modem Local IP	192.168.13.31	
TCP	*HOSTNETMASK	Ethernet Host network mask	0.0.0.0	
UDP		Local USB IP	192.168.14.31	
DNS		Host USB IP	192.168.14.100	
Dynamic IP		Local RS232 IP	192.168.15.31	
PPP/Ethernet		Host RS232 IP	192.168.15.100	
PassThru	*HOSTAUTH	Host Authentication Mode	0	
SMTP	*HOSTUID	Host User ID	ZCFzUUeLycb2ug01L+3Ikvw==	
Other	*HOSTPW	Host Password	ZCFzUUeLycb2ug01L+3Ikvw==	
Firewall	*DHCPSEVER	DHCP Server Mode	1	
Port Forwarding		Host Network 2	0.0.0.0	
LOGGING		Host network mask 2	255.255.255.0	
REPORT		Host Network 3	0.0.0.0	
Server 1		Host network mask 3	255.255.255.0	
1X/EV-DO		Default Interface	0	
TELEMETRY		Default IP	0.0.0.0	
ADDR LIST				
IPSEC				
GRE				
I/O				
WIFI				
???				

- MD = 02-PPP

COM1 - Sierra Wireless AceManager

File Modem Template Tools Help

Connect Refresh Refresh All Disconnect Write Reset Load Save Copy Clear Update PRL Auto Refresh: Disabled

Modem disconnected

GROUPS	MODEM DATA			PRINTABLE VIEW
	AT	Name	Value	New Value
INFO	MD	Startup Mode Default DB9 Serial	00	02-PPP
STATUS	S82	UDP Auto Answer	0	0-Disable
COMMON	S83	UDP Idle Timeout	0	0
Misc	HOR	UDP Auto Answer Response	0	0-No Response
USB	*UDPLAST	UDP Connect Last	0	0-Do not change S53
Serial	AIP	Allow Any IP	0	0-Allow only S53
TCP	*UALL	Allow All UDP	0	0-No effect
UDP	*DU	Dial UDP Always	0	0-Disable
DNS	*USD	UDP Serial Delay	0	0
Dynamic IP				
PPP/Ethernet				
PassThru				
SMTP				
Other				
Friends				
LOGGING				
1X/EV-DO				
TELEMETRY				
ADDR LIST				

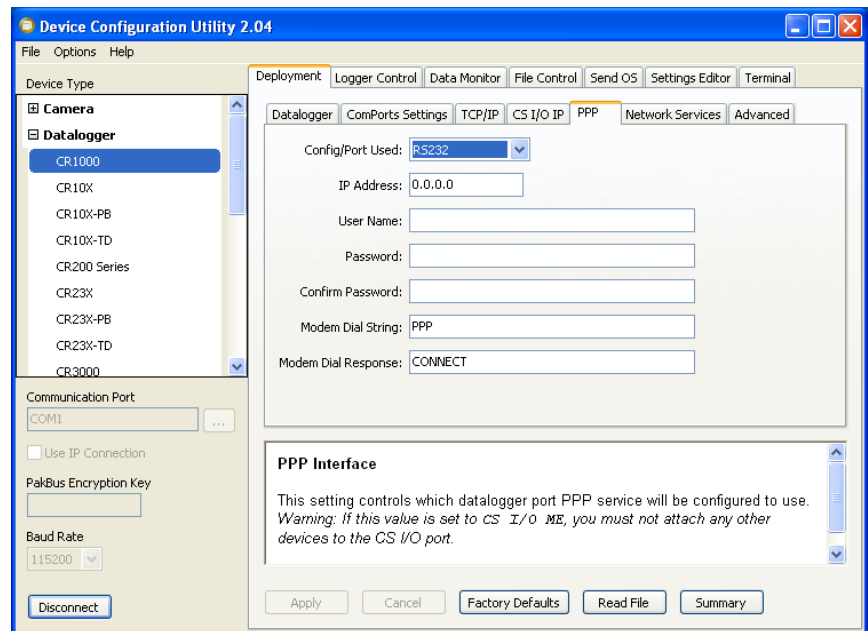
Datalogger Settings:

Using the Device Configuration Utility, configure the following setting on the “PPP” tab:

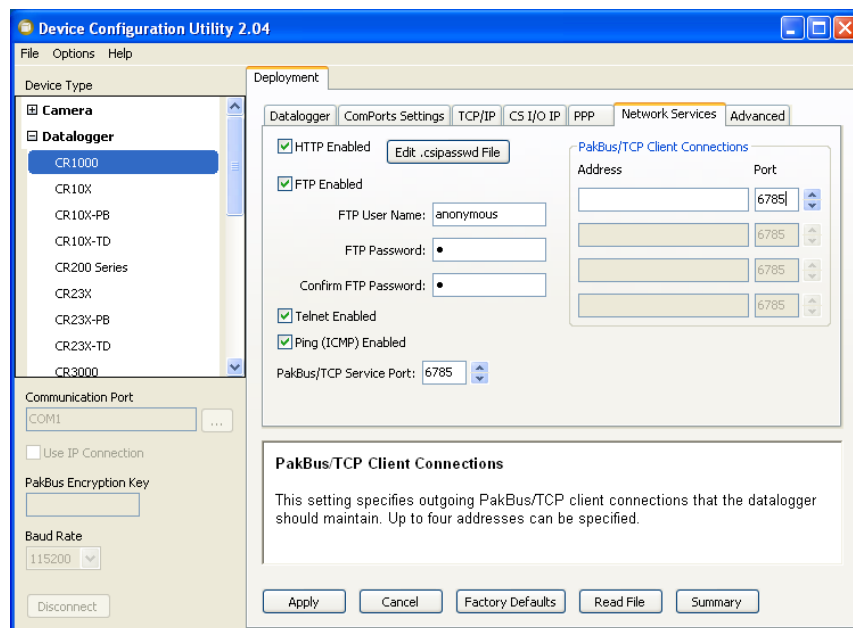
- Config Port Used = RS-232
- IP Address = 0.0.0.0
- Modem Dial String = PPP
- Modem Dial Response = CONNECT
- User Name and Password are blank

NOTE

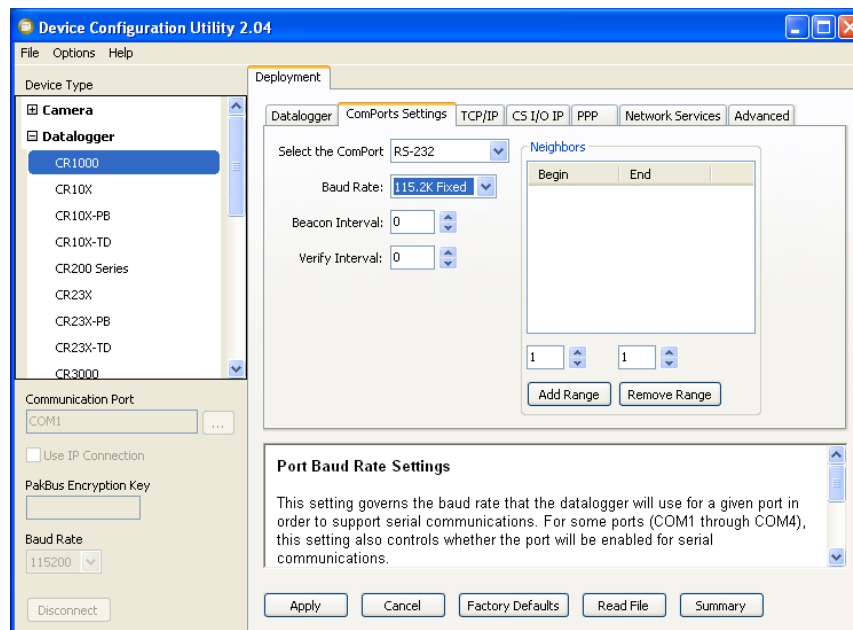
These settings are case sensitive and need to be upper case.



Using the Device Configuration Utility, select the “Network Services” tab. The “PakBus/TCP Service Port” default is 6785. This is the “Port” number that will follow the “IP address” for LoggerNet to communicate with the datalogger.

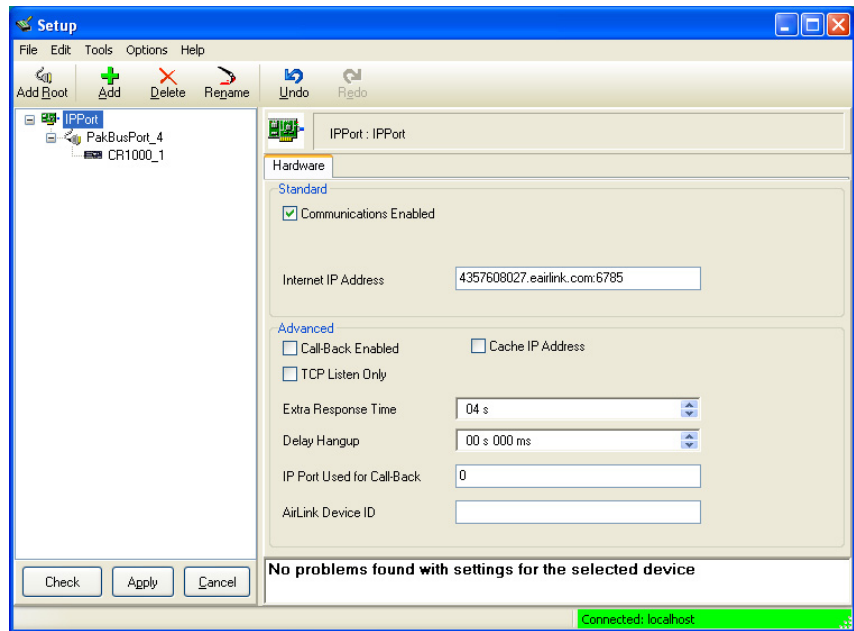


Using the Device Configuration Utility, fix the RS-232 Baud Rate to “115200 Fixed” from the “ComPorts Settings” tab.



LoggerNet Settings:

Enter the IP address of the RavenXTG, and the PakBus/TCP Service Port number of the datalogger (e.g., 6785 as explained above).



Appendix D. EmailSend Using the Gmail Outgoing SMTP Server

The datalogger has a mail client in it similar to a mail client on a computer. For the datalogger to send an email, it needs an SMTP server to send through like any other mail client. The Gmail SMTP server can be used for sending outgoing email from the datalogger. Both the modem and the datalogger must be configured for PPP as described in Appendix C, *Configuring the RavenXTG Modem for PPP*.

D.1 Setting up a Gmail Account

First you need to create a Gmail account if you do not already have one. To create one go to www.gmail.com from your PC. Gmail accounts are free of charge.

The credentials to access the mail server will be the username and password used when creating the Gmail account.

In the following example program you will see:

- ServerAddr set to smtp.gmail.com:587
- UserName set to (the gmail account user name).
- Password (the one you established at gmail)

NOTE

Gmail requires Transport Layer Security (TLS) to connect to their mail server. You must go into the Settings Editor in the Device Configuration Utility to enable TLS in the datalogger.

Early in 2013, Gmail changed the way they receive email. The changes require a port number of 587 to be added to the IP address or server name you are sending to (i.e., 174.194.68.108:587, smtp.gmail.com:587). This will allow for the datalogger to establish a TLS connection with the correct SMTP (Simple Mail Transfer Protocol) port on Gmail's SMTP servers.

Also, a new security feature has been added to Gmail that will prompt if the device/PC sending the email is authorized to do so. You will see a message in the Result variable (of the EmailSend Instruction) that states something to the effect of opening your email account in your web browser. If you see this message, open your web browser and point it to <http://email.google.com>. Enter the username and password that your datalogger is using to send email with. You should then see a red bar at the top of the browser screen. Follow the listed instructions to allow the datalogger to send email.

D.2 Sending to Multiple Addresses

Sending to multiple email address can be done by using a comma to separate the email addresses (4355551212@hotmail.com, 4355551234@vtext.com).

D.3 Sending a Text Message to a Phone

To send a text message to a phone, the email needs to be converted to a text message via an email to text message gateway. Most cellular providers have an email to text message service for their phone subscribers. To send a text message to AT&T Wireless phone subscribers, send an email to the (10 digit phone number of the person's phone)@vtext.com (4355551234@vtext.com).

Most text messages are limited to 160 characters, so any email messages greater than 160 characters will be truncated.

Email-to-Text Message Gateways

T-Mobile: phonenumber@tmomail.net
 Virgin Mobile: phonenumber@ymobl.com
 AT&T: phonenumber@txt.att.net
 Sprint: phonenumber@messaging.sprintpcs.com
 AT&T: phonenumber@vtext.com

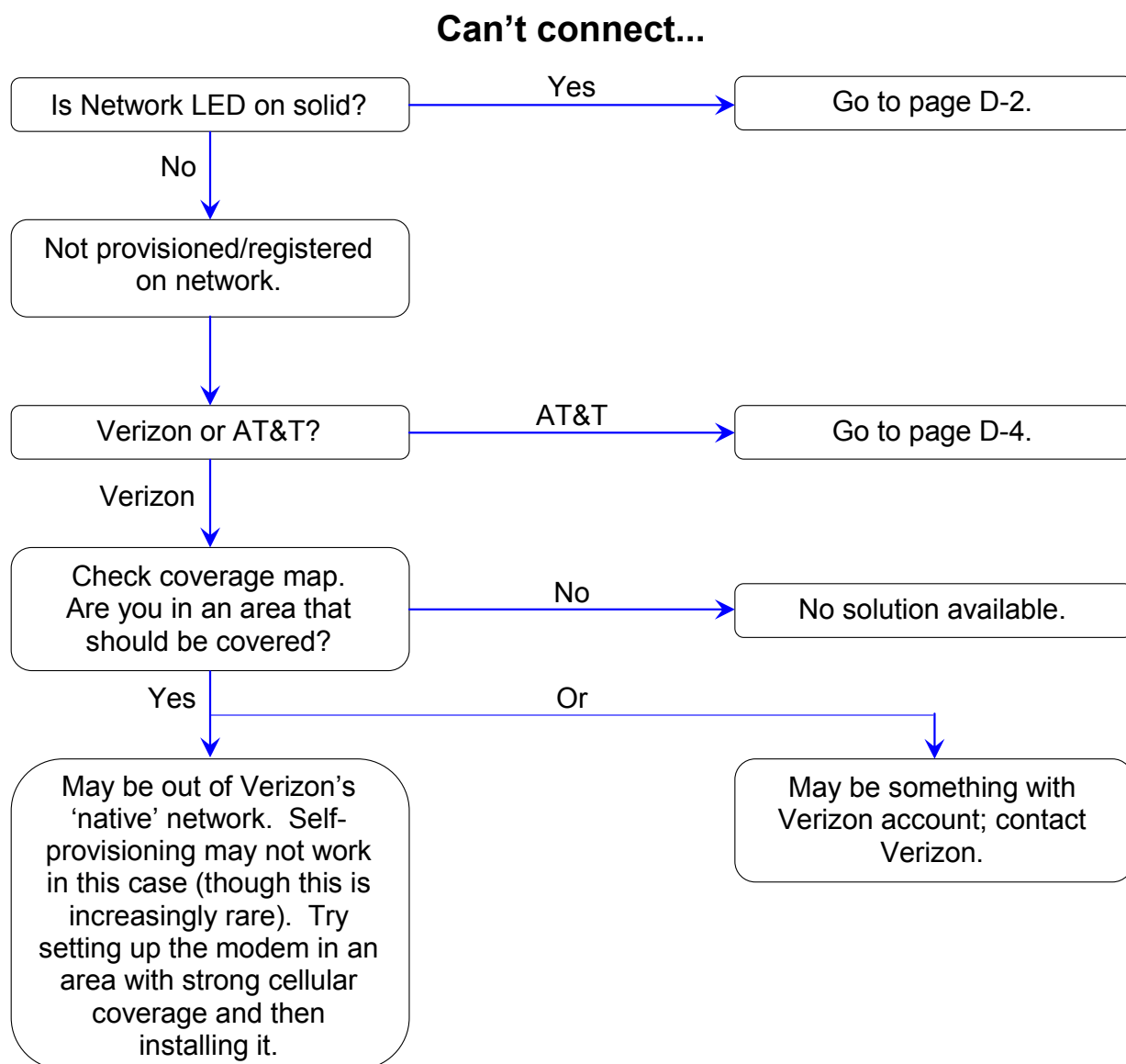
EmailSend Program Example

The following example sends an email message when an alarm condition is True. **Both the CR1000 and RavenXTG modem must be configured as PPP as described in Appendix C, *Configuring the RavenXTG Modem for PPP*. Transport Layer Security (TLS) must be enabled in the datalogger to use the Gmail mail server.**

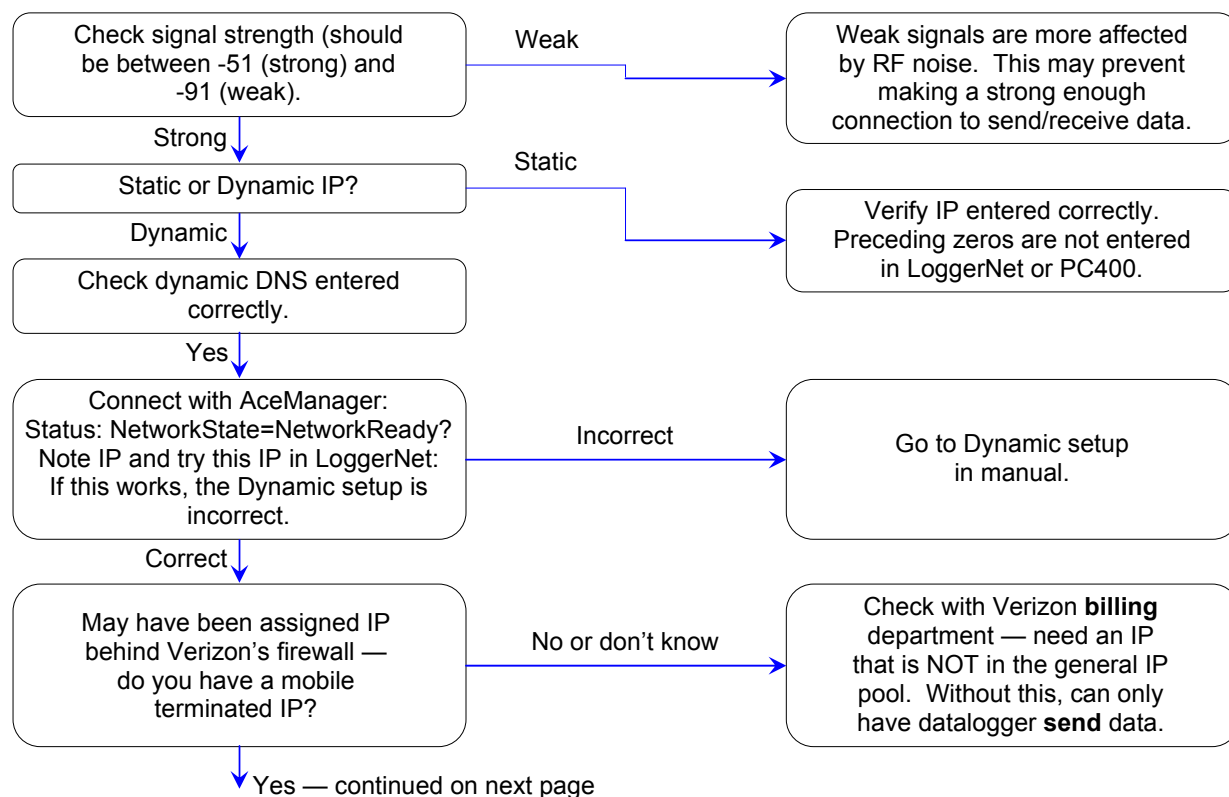
```
'Main program variables
Public Batt, RefTemp, Temp
Public Socket AS Long
'declare Email parameter strings (as constants), Message String & Result Variable
Const ServerAddr="smtp.gmail.com:587"
Const UserName="gmail account name"
Const Password="datalogger"
Const ToAddr="datalogger@hotmail.com, 4355551234@vtext.com"
Const FromAddr="gmailaccount@gmail.com"
Const Subject="Email Message Test"
Const Attach=""
Const CRLF = CHR(13)+CHR(10)
Public Result as String * 100
Public AlarmTrigger As Boolean
Public Message As String * 250
Public EmailSuccess As Boolean
DataTable (TenSecData,True,-1)
DataInterval (0,10,Sec,10)
Sample (1,Batt,FP2)
Sample (1,Temp,FP2)
EndTable
BeginProg
Scan (1,Sec,3,0)
Battery (Batt)
PanelTemp (RefTemp,250)
TCDiff (Temp,1,mV2_5C,1,TypeT,RefTemp,True ,0,250,1.0,0)
CallTable TenSecData
NextScan
SlowSequence
Scan(1,sec,1,0)
If AlarmTrigger = False Then
```

```
If Temp > 27 Then AlarmTrigger = True
If AlarmTrigger Then
Message = "Warning!" + CRLF + CRLF
Message = Message + "An alarm condition has been identified. "
Message = Message + "The temperature is " + Temp + " degrees C." + CRLF + CRLF
Message = Message + "Datalogger time is " + Status.Timestamp
EmailSuccess=EmailSend (ServerAddr,ToAddr,FromAddr,Subject,Message,Attach,UserName>Password,Result)
EndIf
EndIf
If Temp < 27 Then AlarmTrigger=False
NextScan
EndProg
```

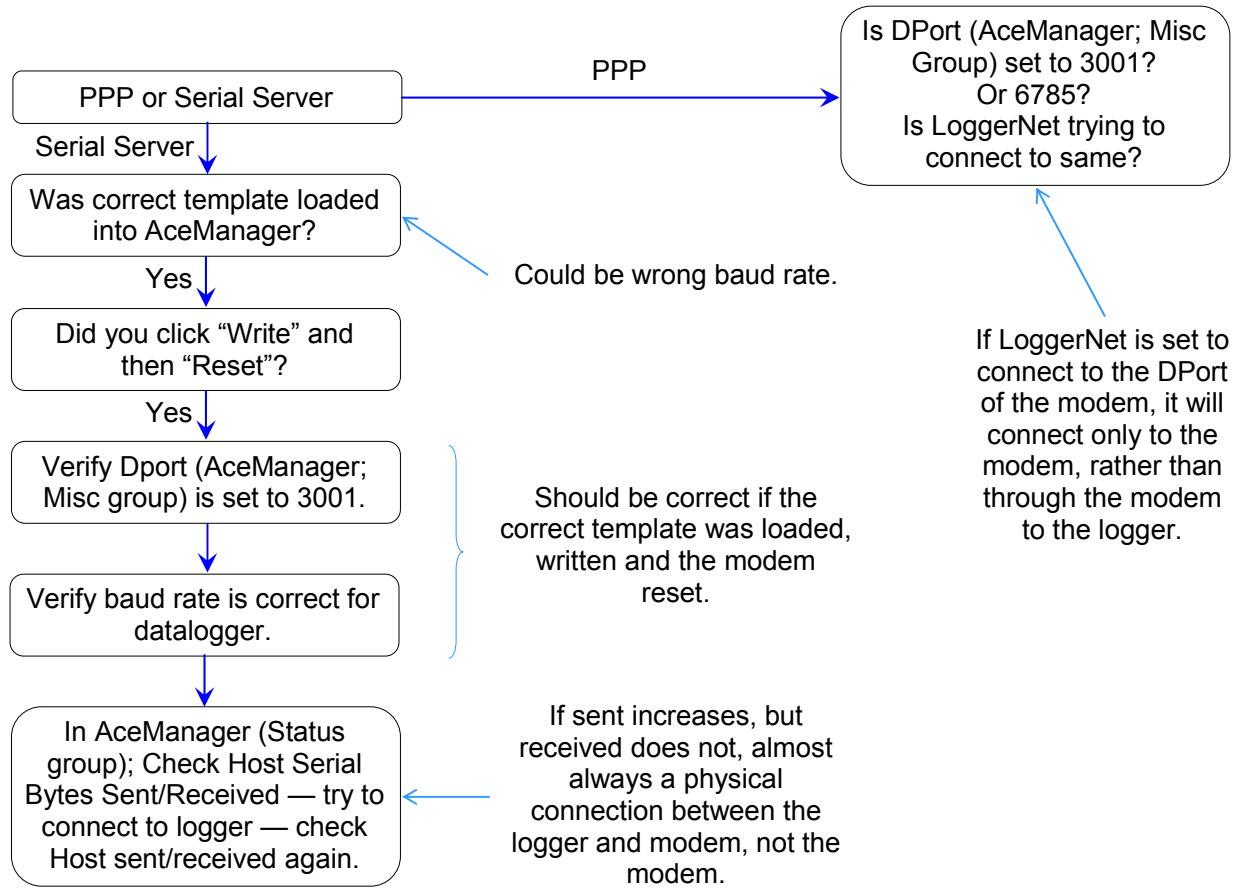

Appendix E. Troubleshooting Flowchart



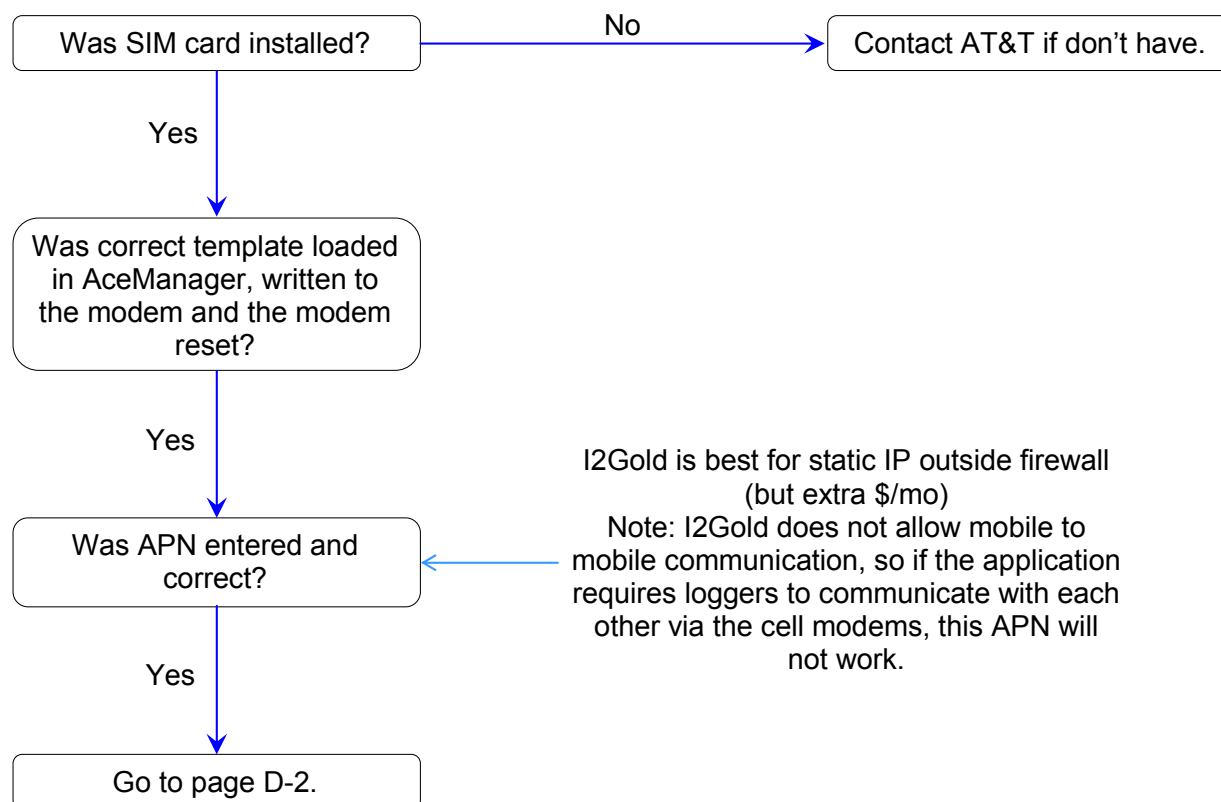
Can't connect, Network light is solid...



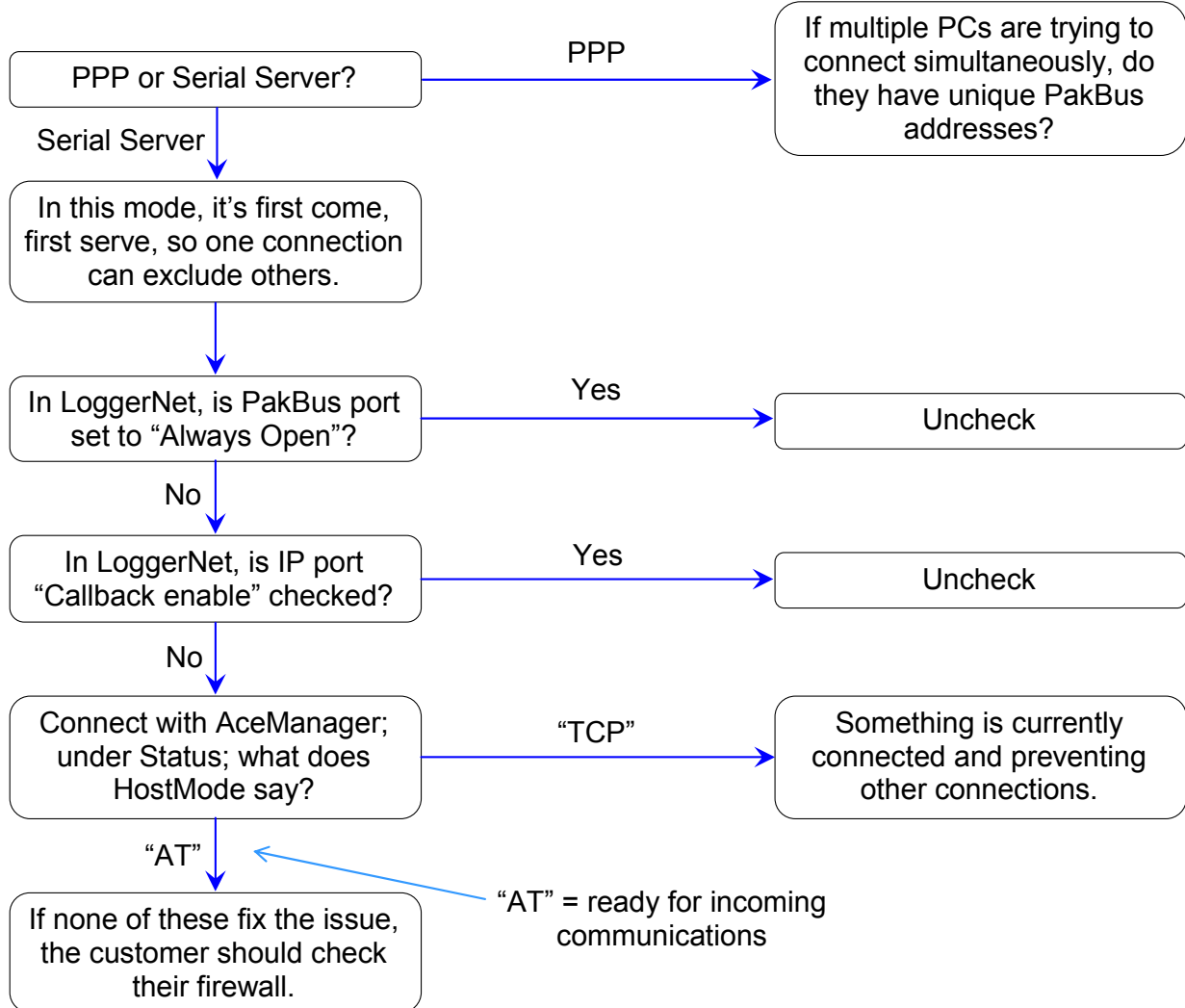
Can't connect, Network light is solid... (cont.) Have mobile terminated IP



Can't connect, AT&T... (cont. from page D-1)



One computer can connect, other(s) cannot...



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